Arcam rCube Service manual

Andy Moore issue 1

Overview

The rCube in its simplest form can be thought of as a high performance iPod docking station with more than a few unique features these include.

Wireless transmission from either iPod transmitter (Arcam Wand) or USB (Arcam Wave) these are both optional extras.

rCubes can transmit to each other from a docked iPod or external source wired source.

Internal battery power supply.

Easily replaceable iPod header (covered latter in manual).

Access

Although very compact the rCube is designed to be serviceable with access gained from underneath to all electronic circuits (remove the four rubber feet) you will see four Philips screws, once these are removed the base plate can be lifted away exposing the main circuit board. The main speaker array is not considered a serviceable part but will be available as a complete assembly. Please see detailed exploded view.

Circuit description

PSU and charge

The 19V D.C PSU for the rCube is derived from either an ***external*** regulated PSU or if not present from the ***internal*** lithium ion battery packs the following is a description of the PSU selection.

The ***external*** 19V power supply is connected to Con600 and is internally fused by the 4A fuse at location FS600 the rear panel switch can be seen at location SW600(a), D600 is used to prevent reverse bias, D602 and TR600 from a D.C sense circuit this line goes to the main micro at location U301 pin 7.

PSU selection is control by the MAX1873 Switch mode Li charge controller at location IC603 the external 19v source can be seen to arrive at pin 15 (DCin) and when present simply by-passes the chip whilst being monitored by pins 1/2 (current sense) and can be seen to form the 19v source net on the diagram. The ***internal*** battery source can be seen connected to CON602 and again travels thru the 2nd pole of switches available on SW600(b) D605 and TR603 are used to form simple logic to indicate to micro U301 that battery power is present, D606 allows a path to the main 19v net whilst preventing reverse bias, the Mosfet (M601) is used to enable charge if necessary when power is present – the entire circuit is overseen by the main micro U301 via

PSU and charge *continued*

the feedback given by IC602 allowing for intelligent charging with charge enable provided from the micro via M602 on the control line labeled as charge_enable making a provision for extended cell life.

Multiple regulators are used to supply the (low) voltage areas of the design these are 1.4A step down adjustable regulators, REG600 receives a 19v source at pin one the output voltage is set by R601 and R640, Mosfet M600 allows for the PSU disable with the 3V standby supply being tapped of prior to the switch.

REG602 and REG603 operate in a similar fashion although utilize the chips own PSU shutdown control option at pin 2 (SD) under control of micro U301, a more conventional regulator is used at location REG601 to provide the 1.8v core supply to U301.

IC601 provides a logic switched (EN_iPod_PWR) current limited +5v supply to the iPod to whilst also preventing an over current situation at the rear panel USB input +3v1 this is reported to the main micro via the USB_PWR_FAULT line.

REG604 (LDO) provides a 3v1 supply to the Kleer and R.F circuits and is sourced from the +5v supply.

IC600 is a charge pump convertor on the +5VA power supply rail.

Micro

The Micro is shown in two halves on the diagram shown as IC301(a) detailing port allocation and IC301(b) detailing power supply requirements and programming header with reset provided by IC303.

PSU requirements include 3V3 STBY and V1.8 (internally generated by the ATMEL)

The below table details the IC301 pin allocations and functions

Pin number	Description	Associated circuit(s)
6	AMP_TEMP_COM	Pin 32 of power amps and locations IC504 IC505 IC506
7	DC_PWR_PRESENT	From TR600 (sheet 6)
9	V_IOUT_POT	From IC603 via IC602 MAX1873 (sheet 6)
10	BATT_PWR_PRESENT	From TR603 (sheet 6)
11	POS_SW	SW301 Rear Panel Bass select switch
12	DSP_12C_SDA	DSP at location IC400
13	DSP_12C_SDL	DSP at Location IC400

IC301 pin allocations and functions ***continued***

Pin number	Description	Associated circuit(s)
14	INT_DISPLAY	To top plate display via iPod header board
16	STBY_LED	To top plate display via iPod hearer board
24	ACC_POWER	From iPod header
25	IPOD_DETECT	From iPod Header
26	VID_CABLE_0	From multi pin video connector at location SKT200
27	PSU_DISABLE	Regulators RG602 and RG603
28	I2C_SDl	Apple authentication chip at location IC300
29	I2c_SDA	Apple authentication chip at location IC300
30	UC595_CLK	8 bit shift register at location IC302(A)
31	UC595_DATA	8 bit shift register at location IC302(A)
33	PROGRAM_SW	No Fit
34	HOST_SPI_DATA_OUT	IC405 and debug
35	HOST_SPI_CLK	IC405 and debug
36	HOST_SPI_CS*	IC405 and debug
37	UC595_LATCH	8 bit shift register at location IC301(A)
38	USB_PWR_FAULT	From IC601
41	SPI_MODE0	Receive / Transmit toggle via IC403
42	SPI_MODE1	Receive / Transmit toggle via IC403
43	VID_CABLE_1	From multi pin video connector at location SKT200
44	IR_EYE	From iPod header interface
45	CHARGE_DISABLE	To IC603 via Mosfet M602
46	ATMEL_/OE	
47	UART_UC_TO_KLEER	Kleer interface data
54	VOL_CLK	To IC501 / IC502 volume controls
55	VOL_DAT	To IC501 / IC502 volume controls
57	IPOD_TO_UC_RS232	iPod interface Data
58	UC_TO_IPOD_RS232	iPod interface Data
59	UART_KLEER_TO_UC	Kleer interface data
60	HOST_SPI_DATA_IN	IC405 and debug
61	AMP_SHDN*	To power amp packages IC504, IC504, IC506
62	AMP_MUTE*	To power amp packages IC504, IC504, IC506
50	USB_D+_UC	USB stick via ESD protection package IC304
51	USB_D-_UC	USB stick via ESD protection package IC304
52	+5V(USB)_STICK	+5V USB stick PSU

Audio in / Video out

iPod audio can be seen as IPOD_AUDO_L and IPOD_AUDIO_R this is driven thru the NJM2114 op-amp at IC201(A/B) before arriving at the DG413 analogue cmos chip at location IC200 (A/B) this switch allows for the routing of either audio from a docked iPod or from the external path via 3.5mm rear panel stereo jack at location SK202 again coming in via a NJN2114 at location IC202 (A/B) also present on this page is the YUV and Composite video outputs these signals are derived directly from the source device and can be seen on circuit as

SVID-C COMP-Y

SVID-Y COMP-PR

CVBS COMP-PB

Default output is Composite with YUV switched when an "Arcam" YUV cable is inserted and the sense on VID_CABLE_0 and VID_CABLE_1 are triggered.

KLEER and DSP

All audio signals are routed thru the Analog Devices DSP chip at location IC400 allowing for not only the High/Low pass filtering of channels for the power amp stage but also bespoke audio manipulation, the analogue audio from either docked iPod or Aux L + R in appearing at pins 78/79 – a Wolfson WM8805 running form a ref 11.2896Mhz clock is used primarily for Jitter reduction for the Kleer input chip at Location IC407 – it is important to note that the Kleer Chip is a receiver or transmitter the Kleer chip is under control of the micro at position U301 the receive / transmit circuit can be seen on the R.F amp circuit. Data for transmission from a docked or external source can be seen coming from the DSP as SDATA_DSP_OUT. The E2PROMS at locations IC405 and IC406 are used to store transmit / receive lock history.

RF AMP

Think of this stage as a transceiver i.e it will both send and receive information from the external target the stage uses toggle switches to effective switch the between the transmit and receive stages.

RF AMP *continue*

The RF stage is both Receive or Transmit (transceiver) allowing Cubes to be linked for docked iPod source and external analogue inputs hence you will see two spate paths that are switched R.F switches seen as IC701 IC702 IC703 two separate Antenna are used and the rCube has the ability to select the most stable aerial at any given time the audio path into/out of the Kleer chip is seen as KL3012 regardless of status – when in receive mode the RF power amp is bypassed by IC701, IC702 in transmission mode both switches are toggled to bring the Saw filter FL700 and Low RF Pass filter FL701 with Power Amp IC704 back in line, The two antenna are connected to the surface mount sockets at SKT700 an SKT701.

DAC Filters and Amplifiers

Audio arrive the DAC filters and Amplifiers circuit from the DSP as 4 separate channels these being TWEET_L/ TWEET_R/ WOOF_L/ WOOF_R each channel travel thru an identical filter circuit TWEET_L channel will be described.

TWEET_R audio arrive at capacitor C508 before traveling into the filter based around the NJM2114 at location IC500 the audio is further filtered by the network of capacitors based around C326 and C327 in combination with C510 – audio then passes into the Volume control IC at location IC501 on pin 1 and can be seen to exit (volume adjusted) on pin 14 – the volume control is under control of the main micro at position U302 via line VOL_CLK / VOL_DAT the line will know be known as TWEET_VOL_R and travels into the Power amp chip at location IC507 (shared with TWEET_VOL_L) this package is driven from the +19v_amp supply and is thermally protect to trigger at 100c / standby and mute control comes from the main micro and temp status of the power amp can be reported to back to the micro.

The WOOF_VOL_L and WOOF_VOL_R audio paths use a bridged power amp each seen at locations IC504 and IC05.

Display and keyboard

The display board is connected to the main board via the iPod header board and it's primary link on the main board is main micro U301.

The board is built around the IC1 a AT42QT1060 6-channel sensor IC this allows for capacitive sensors as keys and also perform the role of driving the top plate LED's with exception of Standby LED status red (this comes directly from U301) the chip is supplied by the 3V14 STBY power supply, the reset circuit shown on the circuit was not required by the final design.

All LEDs are driven from the +5_DIS rail apart from standby (red) as this is on the 3V14(STBY) rail.

Modes indicated by the standby LED

Mode	Illumination
Standby	Red
Power on	Blue
Power on charge	Violet
Program mode (standby held +5 secs)	Flashing red
Receiving software	Fast (strobe)red

Modes indicated by input LED

Mode	Illumination
Syncing to docked iPod	Flashing green
Sync complete	Solid green

Mode indicated by wireless LED

Mode	Illumination
No available lock	Red
Lock present	Green
Searching for link (hold wireless key +5 secs)	Flashing red

Mode indicated by Vol + / - LEDS

Mode	Illumination
Mute	Both LEDS on green

The IR sensor at location RX1 is connected directly to U301 and runs from the 3V14 supply

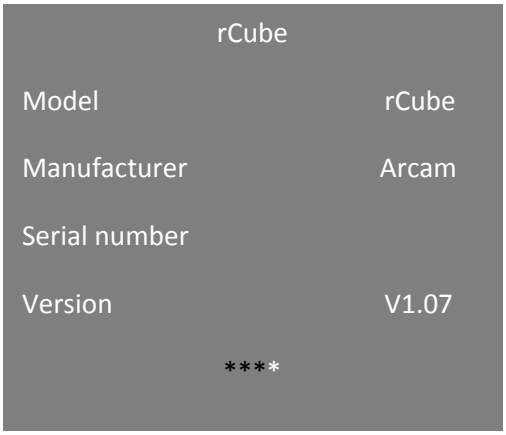
Check software version

Please note – instructions are based on an 80GB iPod classic – the route path is common to all variants.

Place an iPod / iPhone in the rCubes docking receptacle

- Navigate to settings (click)
- Navigate to about (click)

You will now see information regarding the iPods capacity/memory usage navigate to screen four as indicated by the dots at the bottom of the screen and you should see the below or similar.



In this instance we can see that the Software version is V1.07.

To update software

Download the latest SW version available from support@arcam.co.uk or local distributor.

Load this onto a USB memory stick (this needs to be a standard memory stick not on that carries a boot loader such a Cruzors).

- With the cube in standby
- Press and hold the top plate standby button for +5 seconds
- Standby LED should start to flash with a frequency of 2 time a second
- Place memory stick in rear panel port
- LED will now strobe very quickly and the rCube will reset after 15 seconds
- Remove USB stick
- Power cycle rCube (rear panel switch) Check that software version is as expected using iPod as in previously explained procedure.

Accidental software mode initialization

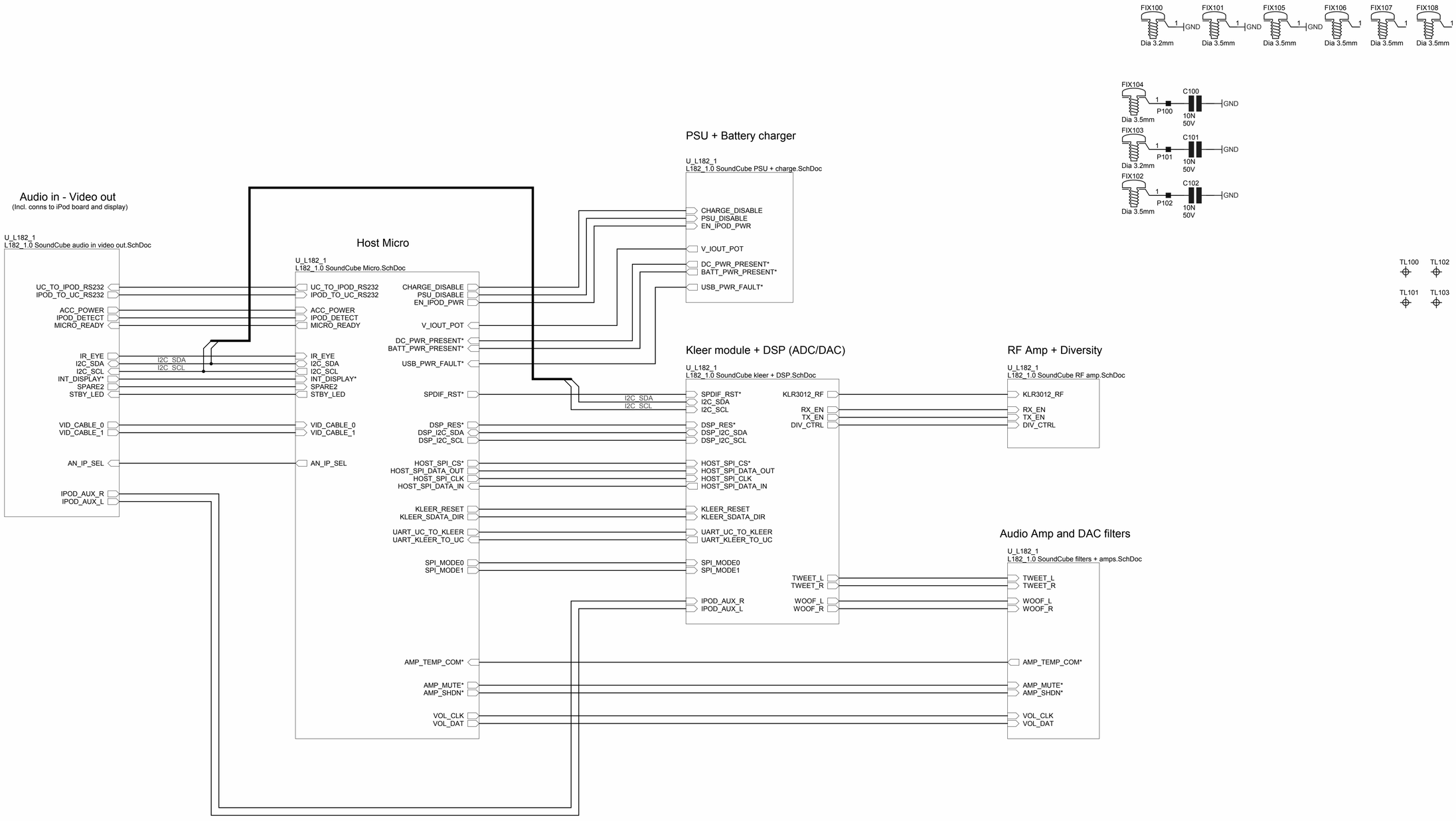
If the rCube is accidently put into program / update mode – simply power cycle to rCube to return to normal operation.

Notes for mac users

The USB update should be stick should be formatted to FAT32 standard and the only file present on the stick should be the software update – i.e no indexing files such as DS_Store files, thumbs.db files use a software such Cleanmymac available at

http://www.macpaw.com/uk/cleanmymac/features

You are interested in the Device Cleanup feature.



ITEM	QTY	PART No.	DESCRIPTION	NOTES
PCB100	1	L182PB	Blank PCB SoundCube Main	

DRAWING TITLE
SoundCube - Top Level

ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE
10_E136	PK	09/09/11	Add test points	1.0
10_E074	PK	30/03/10	Remove sense star connection	C.0
10_E001	PK	05-01-10	None to this sheet	B.0
09_E142	PK	08-07-09	Prototype release	A.0

ARCAM

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Pembroke Avenue
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Filename: L182_1.0 SoundCube Top level.SchDoc

Notes:

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Video breakout cable detection:

VID_CABLE_0	VID_CABLE_1	
0	0	Reserved
0	1	Composite / S-Video cable attached
1	0	Component (3-wire video) cable attached
1	1	No cable - Default to Composite (CVBS)

Analogue input selection table:

AN_IP_SEL
- 0 = iPod
- 1 = Aux

1mA current thru diode

Pins swapped over c.f. iPod connector board

To iPod connector board

CON200 MOLEX 52807

30 +5V(USB)_IPOD
29
28 GND
27
26
25
24
23
22
21
20 +5V
19 IPOD_A/V_RETURN +3V14(STBY)
18 IPOD_AUDIO_R
17 REMOTE_SENSE
16 IPOD_AUDIO_L
15 IPOD_A/V_RETURN
14 SVID-C_COMP-Y
13 SVID-Y_COMP-PR
12 CVBS_COMP-PB
11 IR_EYE
10 I2C_SDA
9 I2C_SCL
8 INT_DISPLAY*
7 SPARE2
6 STBY_LED
5 IPOD_TO_UC_RS232
4 UC_TO_IPOD_RS232
3 ACC_POWER
2 IPOD_DETECT
1 MICRO_READY

P204 R218 0R0 0W063

P214 P203 P205

IR_EYE, I2C_SDA, I2C_SCL, INT_DISPLAY*, SPARE2, STBY_LED, IPOD_TO_UC_RS232, UC_TO_IPOD_RS232, ACC_POWER, IPOD_DETECT, MICRO_READY

Connect remote sense to av return at ffc

Left channel

R200 10K 0W063 — R201 10K 0W063 — P200 — C201 100P 50V 0603 — GND

R203 10K 0W063 — P218

+5VA — C200 100N 16V — GND

IC201A NJM2114M: pin 3 (+), pin 2 (−), pin 8 (+5VA), pin 4 (-5V), pin 1 (out) → P215

C203 100N 16V — GND

R205 10K 0W063

C204 100P 0603 50V

P215 — R202 47R 0W063 0603 — P226 — IC200A DG413DY: 3 → 2, 1 ← AN_IP_SEL

P201 — R204 47K 0W063 0603 — GND

P201 — C202 10UF 50V — P202 — IPOD_AUX_R

Right channel

R206 10K 0W063 — R207 10K 0W063 — P225 — C205 100P 50V 0603 — GND

R209 10K 0W063 — P220

IC201B NJM2114M: pin 5 (+), pin 6 (−), pin 7 (out) → P219

R211 10K 0W063

C209 100P 0603 50V

P219 — R208 47R 0W063 0603 — P227 — DG413DY IC200B: 7 → 6, 8 ← AN_IP_SEL

P206 — R210 47K 0W063 0603 — GND

P206 — C206 10UF 50V — P207 — IPOD_AUX_L

Left channel

+5VA — C212 100N 16V — GND

R213 13K 0W063 — P221 — R212 10K 0W063 — GND

IC202A NJM2114M: pin 3 (+), pin 2 (−), pin 8 (+5VA), pin 4 (-5V), pin 1 (out) → P222

C216 100P 0603 50V

P222 — R214 47R 0W063 0603 — P228 — IC200C DG413DY: 11 → 10, 9 ← AN_IP_SEL

Right channel

R215 13K 0W063 — P223 — R221 10K 0W063 — GND

IC202B NJM2114M: pin 5 (+), pin 6 (−), pin 7 (out) → P224

P224 — R220 47R 0W063 0603 — P229 — IC200D DG413DY: 15 → 14, 16 → AN_IP_SEL

AN_IP_SEL

Input

SK202 Jye Tai 3551: 2 AUX_R, 3 AUX_L, 4 R, 5 L, 1 GND

P216 AUX_R

P217 AUX_L

D200 BAT54S: +5VA, -5V

D201 BAT54S: +5VA, -5V

2.3Vrms should give just under 1vrms out of op amps

IC200E DG413DY

V+ 13 ← +5VA; C219 100N 16V → GND

VL 12 → GND; C221 100N 16V → GND

GND 5 → GND

V- 4 → -5V

Video

SVID-C_COMP-Y P208 — C207 470UF 16V — P209 — C208 100N 16V

SVID-Y_COMP-PR P211 — C210 470UF 16V — P210 — C211 100N 16V

CVBS_COMP-PB P212 — C214 470UF 16V — P213 — C215 100N 16V

SKT200 1201-05M NELTRON: 7, 8, 5, 6, 3, 4, 1, 2; SCRN1, SCRN2, SCRN3 → GND

VID_CABLE_1 — R216 10K 0W063 0603 — +3V14 — R217 10K 0W063 0603 — VID_CABLE_0

VID_CABLE_0

VID_CABLE_1

IPOD_A/V_RETURN — SKT201 JYE TAI RJ: 2b, 1a

DRAWING TITLE: **SoundCube - audio in / video out**					
	10_E136	PK	09/09/11	Add test points	1.0
	10_E074	PK	30/03/10	Correct grounding scheme for video connectors Correct -ve input to input op amps	C.0
	10_E001	PK	05-01-10	Change op amps to unity gain single ended	B.0
	09_E142	PK	08-07-09	Prototype release	A.0
	ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

ARCAM

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Filename: L182_1.0 SoundCube audio in video out.SchDoc

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A3

DRAWING NO. L182CT

IC CPU Apple authentication IC WWI QFN package

IC300
MF1341S2164

+3V14(STBY)
C302 100N 16V GND
MODE0/SPI_CLK
MODE1/SPI_nSS
/RES
VCC
VSS
SDA/SPI_SOMI
SCL/SPI_SIMO
AUTH_RST*
R300 2K2 0W063 0603
R301 2K2 0W063 0603
I2C_SDA
I2C_SCL

C300 18P 50V 0603
X300 12MHz
C301 18P 50V 0603
P356 P357

IC301A
AT32UC3B0256-A2UT

PB10 PB09 PB08 PA23 PA22 PA21 PA20 PB07 PB29 PB28 PA19 PA18 PB06 PA17
IPOD_TO_UC_RS232 VOL_DAT VOL_CLK UART_UC_TO_KLEER ATMEL_OE CHARGE_DISABLE IR_EYE VID_CABLE_1 SPI_MODE1 SPI_MODE0 USB_PWR_FAULT* UC595_LATCH

UC_TO_IPOD_RS232 PB11
UART_KLEER_TO_UC PA24
HOST_SPI_DATA_IN PA25
AMP_SHDN* PA26
AMP_MUTE* PA27
USB D+ UC DDP
USB D- UC DDM
+5V(USB)_STICK VBUS

PA16 HOST_SPI_CS*
PA15 HOST_SPI_CLK
PA14 HOST_SPI_DATA_OUT
PA13 PROGRAM_SW
PA12 UC595_DATA
PA11 UC595_CLK
PA10 I2C_SDA
PA09 I2C_SCL

PB00 PB01 PA03 PA04 PA05 PA06 PA07 PA08 PA30 PA31 PB02 PB03 PB04 PB05
AMP_TEMP_COM* DC_PWR_PRESENT* V_IOUT_POT BATT_PWR_PRESENT* POS_SW DSP_I2C_SDA DSP_I2C_SCL INT_DISPLAY* SPARE2 STBY_LED ACC_POWER IPOD_DETECT VID_CABLE_0 PSU_DISABLE

+3V14(STBY) R304 47K 0W063 0603

IPOD_TO_UC_RS232 ↔ P302 ↔ UC_TO_IPOD_RS232
VOL_DAT ↔ P304 ↔ VOL_DAT
VOL_CLK ↔ P305 ↔ VOL_CLK
UART_KLEER_TO_UC ↔ P306 ↔ UART_UC_TO_KLEER
IR_EYE ↔ P308
VID_CABLE_0 ↔ P309
VID_CABLE_1 ↔ P310
SPI_MODE0 ↔ P311 ↔ SPI_MODE0
SPI_MODE1 ↔ P312 ↔ SPI_MODE1
USB_PWR_FAULT* ↔ P313
CHARGE_DISABLE ↔ P314 ↔ CHARGE_DISABLE
HOST_SPI_CS* ↔ P315 ↔ HOST_SPI_CS*
HOST_SPI_CLK ↔ P316 ↔ HOST_SPI_CLK
HOST_SPI_DATA_IN ↔ P317
HOST_SPI_DATA_OUT ↔ P318 ↔ HOST_SPI_DATA_OUT
INT_DISPLAY* ↔ P319
I2C_SDA ↔ P320 ↔ I2C_SDA
I2C_SCL ↔ P321 ↔ I2C_SCL
PSU_DISABLE ↔ P322 ↔ PSU_DISABLE
IPOD_DETECT ↔ P323
ACC_POWER ↔ P324
SPARE2 ↔ P325
WAS STANDBY SW
STBY_LED ↔ P326 ↔ STBY_LED
DSP_I2C_SDA ↔ P327 ↔ DSP_I2C_SDA
DSP_I2C_SCL ↔ P328 ↔ DSP_I2C_SCL
BATT_PWR_PRESENT* ↔ P330
DC_PWR_PRESENT* ↔ P331
V_IOUT_POT ↔ P332
AMP_TEMP_COM* ↔ P333
AMP_SHDN* ↔ P334 ↔ AMP_SHDN*
AMP_MUTE* ↔ P335 ↔ AMP_MUTE*

+3V14(STBY) CON301 HARWIN M20-973 GND

Aardvark debug pin headers

CON300 HARWIN M20-973
1 DSP_I2C_SCL
2 DSP_I2C_SDA

CON302 HARWIN M20-973
1 I2C_SCL
2 I2C_SDA

CON303 HARWIN M20-973
1 HOST_SPI_CLK
2 HOST_SPI_DATA_OUT
3 HOST_SPI_CS*
4 HOST_SPI_DATA_IN

+3V14(STBY)
R311 10K 0W063 0603
R312 10K 0W063 0603
IPOD_TO_UC_RS232
UC_TO_IPOD_RS232

+3V14(RF)
R313 10K 0W063 0603
R314 10K 0W063 0603
UART_KLEER_TO_UC
UART_UC_TO_KLEER

+3V14
R315 10K 0W063 0603
R316 10K 0W063 0603
DSP_I2C_SDA
DSP_I2C_SCL

+3V14
R317 10K 0W063 0603
R320 10K 0W063 0603
HOST_SPI_CS*
HOST_SPI_CLK
GND

NF SW300
+3V14(STBY)
R303 47K 0W063 0603
P329 PROGRAM_SW
SDTA-620-N
R302 0R0 0W063 0603 NF
GND

SW301B NC2 C2 NO2 SPUJ190900
SW301A NC1 C1 NO1 SPUJ190900
+3V14(STBY)
R321 47K 0W063 0603
P301 POS_SW
R322 47K 0W063 0603
GND

IC302A

UC595_DATA ↔ P336 ↔ DS
UC595_CLK ↔ P339 ↔ SHCP
UC595_LATCH ↔ P341 ↔ STCP
ATMEL_/RES ↔ MR, OE

Q0 P337 DSP_RES*
Q1 P338 EN_IPOD_PWR
Q2 P340 MICRO_READY
Q3 P342 AN_IP_SEL
Q4 P343 SPDIF_RST*
Q5 P344 AUTH_RST*
Q6 P345 KLEER_SDATA_DIR
Q7 P346 KLEER_RESET
Q7'/DO

74HC595D SO-16

R318 10K 0W063 0603
R319 10K 0W063 0603
GND

HC family to run on 3V14 supply

+3V14(STBY)
R306 10K 0W063 0603
ATMEL_/OE ↔ P300

Pullup makes 595 outputs HiZ until micro is awake to set the outputs to the correct state. Critical outputs of '595 will be held in correct state by pull up/down resistors.

USB ESD protection.

CON304 Tyco 292303
+5V(USB)_STICK ↔ P355
USB_D- ↔ P347 ↔ R305 39R ↔ P348
USB_D+ ↔ P350 ↔ R307 39R ↔ P351
0W063 0603
C306 100UF 16V RX
GND

NF R309 0R0 0W063 0603
NF R310 0R0 0W063 0603

IC304
USBLC6-2SC6
SOT23-6L
I/O1 GND I/O2
I/O1 VBUS I/O2
USB_D- UC ↔ P349
USB_D+ UC ↔ P352
+5V(USB)_STICK
NF C313 100N 16V 0603

+1V8 _AT64 IS GENERATED BY THE ATMEL

+3V14(STBY) +1V8_AT64
C304 10uF 10V 1206
C307 1N0 50V 0402
C305 2u2F 50V 1206
C308 470P 50V
P353
C303 100N 16V 0402
C314 100N 16V 0402
C315 100N 16V 0402
GND

IC301B
AT32UC3B0256-A2UT

VDDIN VDDOUT VDDCORE VDDCORE VDDCORE

C316 100N 16V 0402
C317 100N 16V 0402
C318 100N 16V 0402
C319 100N 16V 0402
VDDIO VDDIO VDDIO

TMS ↔ TMS
TDO ↔ TDO
TDI ↔ TDI
TCK ↔ TCK

+1V8_AT64
C320 100N 16V 0402
C321 1N0 50V 0402
VDDPLL
VDDANA

/RESET ↔ P354 ↔ ATMEL_/RES

+3V14(STBY)
C311 1UF 6.3V 0603
C312 10N 16V 0402
ADVREF

GND GND GND GND

IC303
LM809M3-2.63
RST VCC GND
+3V14(STBY)
C310 100N 16V 0603
GND

IC302B
+3V14(STBY)
VCC
C309 10N 50V 0603
GND
74HC595D SO-16

CON305
+3V14(STBY)
TCK
TDO
TMS
ATMEL_/RES
TDI
HARWIN M20-972
GND

DRAWING TITLE **SoundCube - Micro**					
	10_E136	PK	09/09/11	Add test points	1.0
ARCAM	10_E074	PK	30/03/10	None to this sheet	C.0
Filename: L182_1.0 SoundCube Micro.SchDoc	10_E001	PK	05-01-10	12MHz crystal, authentication IC package change Program line pulled high, dbug header changed	B.0
Notes:	09_E142	PK	08-07-09	Prototype release	A.0
	ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

A & R Cambridge Ltd.
Pembroke Avenue
Waterbeach
Cambridge CB25 9QR

Contact Engineer: Mark Tweedale markt@arcam.co.uk
Contact Tel Direct: 01223 203210
Contact Tel Reception: 01223 203200
Printed: 28/09/2010
Sheet 3 of 7 | A2 | DRAWING NO. L182CT

SPDIF receiver needs to be on +3V14(STBY) supply because it shares an I2C control bus with other parts on +3V14(STBY) - namely the display board. Hold SPDIF receiver in reset when in standby to minimise current draw.

Pin 7 - SDIN/HWMODE needs to be pulled up during device reset to put the device into software control mode on un-reset. However the I2C_SDA line already has a pullup elsewhere (by IC300) so one is not needed here.

Lo sets 2-wire (I2C) mode

I2C_SDA - Hi sets S/W mode (pulled high elsewhere)

Sets base address to:
0111010x
x: 0=read / 1=write

NC - MCLK not required

Crystal is option if needed.

AVDD: 3V3 with 10u and 100nF decoupling to AGND

DVDD: 1.8V with 10u and 100nF decoupling to DGND

Input has dc bias

Output has dc bias

VDD suppliy for Kleer = 3.0V "Max", 3.6V "Abs Max"

RESET* input cannot be driven high by host
Pin must by Hi-Z or pulled low only.
Kleer has internal pull-up.

UART0 - make available for KDT or production test on header

Interquip - ensure Kleer databases are configured correctly

TEST pin must be tied low

A1 : A0 SPI_MODE
00 KLEER > RECIEVE E2PROM
01 KLEER > TRANSMIT E2PROM
10 HOST > RECIEVE E2PROM
11 HOST > TRANSMIT E2PROM

RECIEVE E2PROM

TRANSMIT E2PROM

DRAWING TITLE **SoundCube - Kleer + DSP**					
	10_E136	PK	09/09/11	Add test points	1.0
ARCAM	10_E074	PK	30/03/10	None to this sheet	C.0
Filename: L182_1.0 SoundCube kleer + DSP.SchDoc	10_E001	PK	05-01-10	SPDIF input to 8805 / DSP removed	B.0
Notes:	09_E142	PK	08-07-09	Prototype release	A.0
	ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

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Sheet 4 of 7
A2
DRAWING NO. L182CT

AMP_SHDN*
AMP_MUTE*
These two need pulldowns so that the default state of the amp is DISABLED.

IC500A NJM2114M
IC500B NJM2114M
IC501 BD3812F-E2
IC502 BD3812F-E2
IC503A NJM2114M
IC503B NJM2114M
IC504 MAX9709ETN+
IC505 MAX9709ETN+
IC506 MAX9709ETN+

Address xxxx x00x
Address xxxx x11x

VOL_CLK
VOL_DAT

TWEET_R
TWEET_L
WOOF_R
WOOF_L

TWEET_VOL_R
TWEET_VOL_L
WOOF_VOL_R
WOOF_VOL_L

WOOF_OUT_L+
WOOF_OUT_L-
WOOF_OUT_R+
WOOF_OUT_R-
TWEET_OUT_L+
TWEET_OUT_L-
TWEET_OUT_R+
TWEET_OUT_R-

AMP_SHDN*
AMP_MUTE*
AMP_TEMP*
AMP_SYNC
AMP_TEMP_COM*

+19V_AMP_LW
+19V_AMP_RW
+19V_AMP_T
+19V_AMP

Replace with ferrite bead?

1 pair per bank of three VDD pins

Thermal trigger = 100degC

JST XH (HORIZONTAL)

DRAWING TITLE: SoundCube - DAC filters + amplifers	10_E136	PK	09/09/11	Add test points	1.0
ARCAM	10_E074	PK	30/03/10	Add WWI caps to power amp +ve input pins Add amp output filter, remove option resistors	C.0
A & R Cambridge Ltd. Pembroke Avenue Waterbeach Cambridge CB25 9QR	10_E001	PK	05-01-10	Added WWi caps to all volume control IC pins	B.0
Filename: L182_1.0 SoundCube filters + amps.SchDoc Notes:	09_E142	PK	08-07-09	Prototype release	A.0
	ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

Contact Engineer: Mark Tweedale markt@arcam.co.uk
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Printed: 28/09/2010
Sheet 5 of 7 | A2 | DRAWING NO. L182CT

Approx. 19V

DC input jack

CON600 — P608 — FS600 (T4A, Fuse Littelfuse T4A SM RoHS) — P609 — S1 — NO1 — SW600A SDDJE32100

Vf = 0.48V @ 3.5A 25degC
Reverse voltage = 60V max

D600 PDS760 — P607 — DCIN

Reverse voltage = 30V max
(This should be fine - just.)

D602 BAT54A SOT-23

R607 47K 0W063 0603 — P610 — P678

TR600 MMUN2211LT1

+3V14 — R603 47K 0W063 0603 — DC_PWR_PRESENT* — to uC DC_PWR_PRESENT*

to reduce power used to detect dc supply

Need to look into how to keep +3V3(STBY) suppliy alive long enough after 19V DC or battery supply has been switched off to perform controlled shutdown.

(bulk storage caps on the pre regulator side)

+19V(3REG)

C649 10N 50V — C600 1UF 25V 0805 — GND

REG600 LM25574

VIN, SD*, BST, SW, PRE, SYNC, RAMP, SS, RT, IS, OUT, FB, COMP, VCC, AGND, PGND

C651 1N0 50V — R602 P61410R 0W5

L600 100U

P615 — C601 22N 50V 0805

P624

P636 — D601 DFLS230LH

P635 — P634 — P639 — C606 470P 50V 0603 — C607 10N 50V 0603 — R604 20K 0W063 0603

20k sets approx 300kHz (faster clock is master)

P641 — R605 24K 0W063 — P642 — C608 22N 50V 0805

P643 — C609 470N 50V

R601 4K7 0W063 0603 — P640 — R606 3K0 0W063 0603

C650 10N 50V — C603 10UF 6.3V X5R — +3V14(STBY) — C602 470UF 16V RX

P600 — M600 FDV303N SOT-23 — P601 — +3V14

R636 10K 0W063 SM0603 — +5V

P637 — TR604 MMUN2211LT1 SOT-23

PSU_DISABLE

Pulldown not required on this line to force +3V14 ON (i.e. the non-standby supply) when the uC is booting in USB upgrade mode as digital transistors on this control line elsewhere include internal pulldowns.

+3V14 — C604 100UF 16V — REG601 LM1117MPX-1.8 — +1V8 — +1V8(D) — C605 100UF 16V — P602 — GND

+19V(7REG)

C610 1UF 25V 0805 — GND

REG602 LM25574

VIN, SD*, BST, SW, PRE, SYNC, RAMP, SS, RT, IS, OUT, FB, COMP, VCC, AGND, PGND

SD* has internal pull-up to enable

from uC — PSU_DISABLE — TR601 MMUN2211LT1 SOT-23

P625

P646 — P647 — P648 — C616 470P 50V 0603 — C617 10N 50V 0603 — R610 24K 0W063 0603

24k sets approx 260kHz (slave)

C611 22N 50V 0805 — L601 100U

P644 — P645

D603 DFLS230LH — P617

P649 — R612 1K8 0W063

P651 — R611 24K 0W063 — P650 — C618 22N 50V 0805

P652 — C620 470N 50V

C609 470N 50V

R609 5K6 0W063 — P603 — +5VA — C613 470UF 16V RX

C614 10uF 10V X5R

Fit for 900kHz osc, NF for 120kHz

+5VA — R608 0R0 0W063 — P673 — IC600 SP6661EN-L (FC, CAP+, GND, CAP-, V+, OSC, LV, VOUT) — +5VA — C612 22UF 63V RX

C615 22UF 63V RX — C619 22UF 63V RX — P604 — -5V

GND_CHG — P611 — P612 — P613 — P616 — P618 — SP600 — PGND

+19V(5REG)

C622 10N 50V — C623 1UF 25V 0805 — C653 1UF 25V 0805 — GND

REG603 LM25575

VIN, SD*, BST, SW, PRE, SYNC, RAMP, SS, RT, IS, OUT, FB, COMP, VCC, EPGND, AGND, PGND

C647 1N0 50V — P653 — R615 10R 0W5

C624 22N 50V 0805 — P654

L602 47U

P655

D604 MBRS360T3G — P679

P627 — TR602 MMUN2211LT1 SOT-23 — PSU_DISABLE

P656 — P657 — P658 — C648 470P 50V 0603 — C656 10N 50V 0603 — R616 24K 0W063 0603

P660 — R617 24K 0W063 — P661 — C657 22N 50V 0805

P662 — C658 470N 50V

P605 — R600 5K6 0W063 — P659 — R620 1K8 0W063

C626 10N 50V — C646 10uF 10V X5R — +5V — C625 470UF 16V RX — SP601 — P629 — +5V(USB)

iPod power switch

(and current limit for USB memory stick)

Guarantees no iPod power at cube turn on

+5V(USB) — EN_IPOD_PWR — R635 10K 0W063 0603

IC601 ST2052BDR S0-8 500mA limit

(IN, EN1, EN2, GND, OUT1*, OC1*, OUT2, OC2*)

P626 — +5V(USB)_IPOD

USB_PWR_FAULT* — +5V(USB)_STICK

+3V14 — R613 10K 0W063 SM0603 — USB_PWR_FAULT*

+5V — C621 100N 16V 0603 — GND

IC602 LMV321IDCKR SC70-5

P674 — P628

R614 5K1 0W063 0603 — V_IOUT_POT — V_IOUT_POT

Output scaled to 3V3 range to uC ADC input

R619 10K 0W063 0603

R618 100R 0W063 0603

Put pullup on STBY supply in case we want to charge in standby mode.

+3V14(STBY) — R629 10K 0W063 0603 — from uC — CHARGE_DISABLE

Pullup disables charging by default.

CHARGE_DISABLE

M602 FDV303N SOT-23

GND_CHG

DCIN

C629 2u2F 50V 1206 X7R — P638 — P663 — C627 220N 50V 0805 — C628 220N 50V 0805 — GND_CHG

IC603 MAX1873TEEE

VL, VH, DCIN, CSSP, CSSN, IOUT, ICHG/EN, CCI, CCS, CCV, EXT, CSB, BATT, REF, VADJ, GND

V_IOUT_RAW — P630

R627 100K 0W063 0603

P631

C638 47N 50V 0805 — P667

C639 47N 50V 0805 — P669

C640 100N 50V 0805 — P670 — R631 0603 10K

C644 1N0 50V 0603 — P672

P665 — C635 10N 50V 0603 — R622 4R7 0W063 0603 — R623 0R033 1W SM1218

P666 — C637 10N 50V 0603 — R626 4R7 0W063 0603

R637 56R 0W063 — P680 — P681

M601 NTF2955 SOT-223

D607 DFLS230LH

L603 3A 15uH — R630 0R15 0W5 SM1206

P633 — P676

C636 100UF 35V

D606 PDS1040L

Diode allows battery to power cube when DC supply removed

P632

C642 100N 50V 0805 — C643 100N 50V 0805 — C641 100UF 25V RX

SW600B NO2 — S2 — SDDJE32100 — CON602 MOLEX 5569

REF = 4.2V at very low current

R632 100K 0W063 0603 — C645 1UF 6.3V 0603 X5R

P677 — R633 100K 0W063 0603

P671

R634 100K 0W063 0603

+19V(7REG) — P619 — SP602

+19V(5REG) — P620

+19V(3REG) — P621 — SP603

+19V_AMP — P622 — P623 — +19V

D605 BAT54A SOT-23

+3V14 — R625 47K 0W063 0603 — BATT_PWR_PRESENT* — to uC BATT_PWR_PRESENT*

TR603 MMUN2211LT1

P668 — R628 47K 0W063 0603 — P675

to reduce power used to detect dc supply

Drain on battery due to detect ckt:
I = V/R = 16.8/67k = 250uA
Battery capacity = 2.3Ah
Time = 2.3/250u = 9200h = 383days
So, current draw by this bit is insignificant c.f. uC standby current

LDO regulator (for Kleer / RF)

+5V — R638 10R 0W25 — R639 10R 0W25

C659 470UF 16V RX — C652 1N0 50V — C630 1N0 50V — C631 1UF 25V 0805 X5R

REG604 TPS79501DRBR (IN, IN, EN, OUT, OUT, FB, GND, PAD)

P606 — +3V14(RF)

R621 47K 0W063 0603 — C634 15P 50V 0805 0603 — C632 1UF 25V 0805 X5R — C633 1N0 50V

R624 30K 0W063 0603 — P664

DRAWING TITLE: **SoundCube - PSU + charge**					
	10_E136	PK	09/09/11	Add test points	1.0
ARCAM	10_E074	PK	30/03/10	Remove sense star and av return from star point Change 5V regulator, remove additonal grounds	C.0
Filename: L182_1.0 SoundCube PSU + charge.SchDoc	10_E001	PK	05-01-10	M600 changed to N type and footprint corrected R612 changed to 1k8. CON602 pin out change to put on bottom of PCB	B.0
Notes:	09_E142	PK	08-07-09	Prototype release	A.0
	ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

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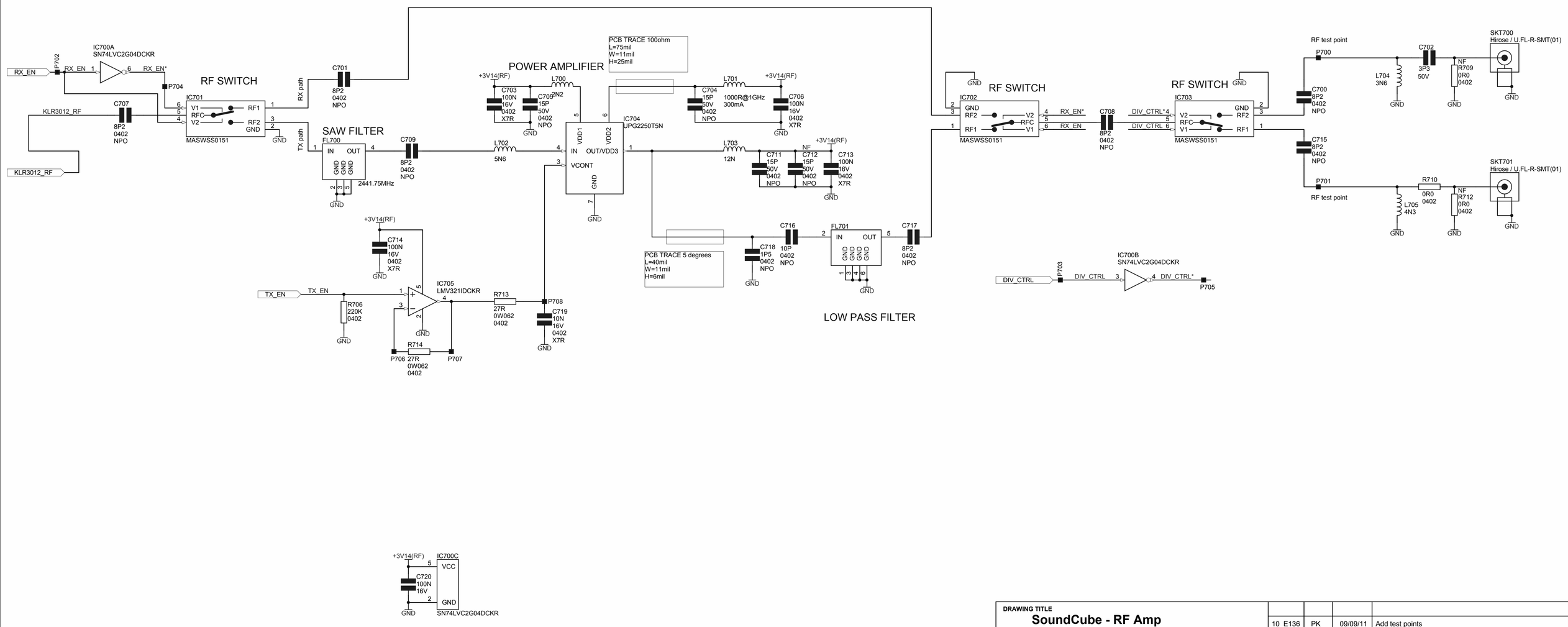
Printed: 28/09/2010
Sheet 6 of 7
A2
DRAWING NO. L182CT



DRAWING TITLE **SoundCube - RF Amp**					
	10_E136	PK	09/09/11	Add test points	1.0
ARCAM	10_E074	PK	30/03/10	Kleer value recomendations	C.0
Filename: L182_1.0 SoundCube RF amp.SchDoc	10_E001	PK	05-01-10	None to this sheet	B.0
Notes:	09_E142	PK	08-07-09	Prototype release	A.0
	ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE

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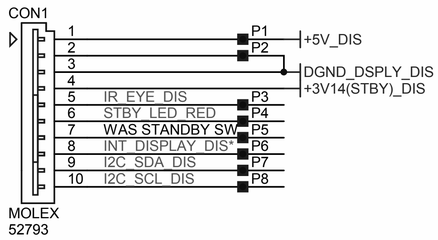
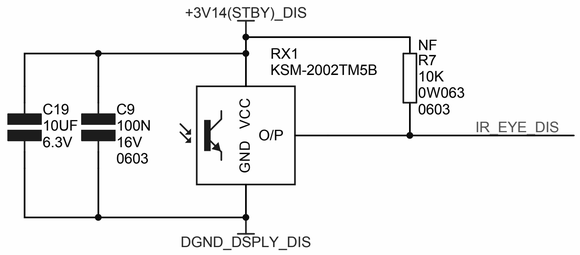
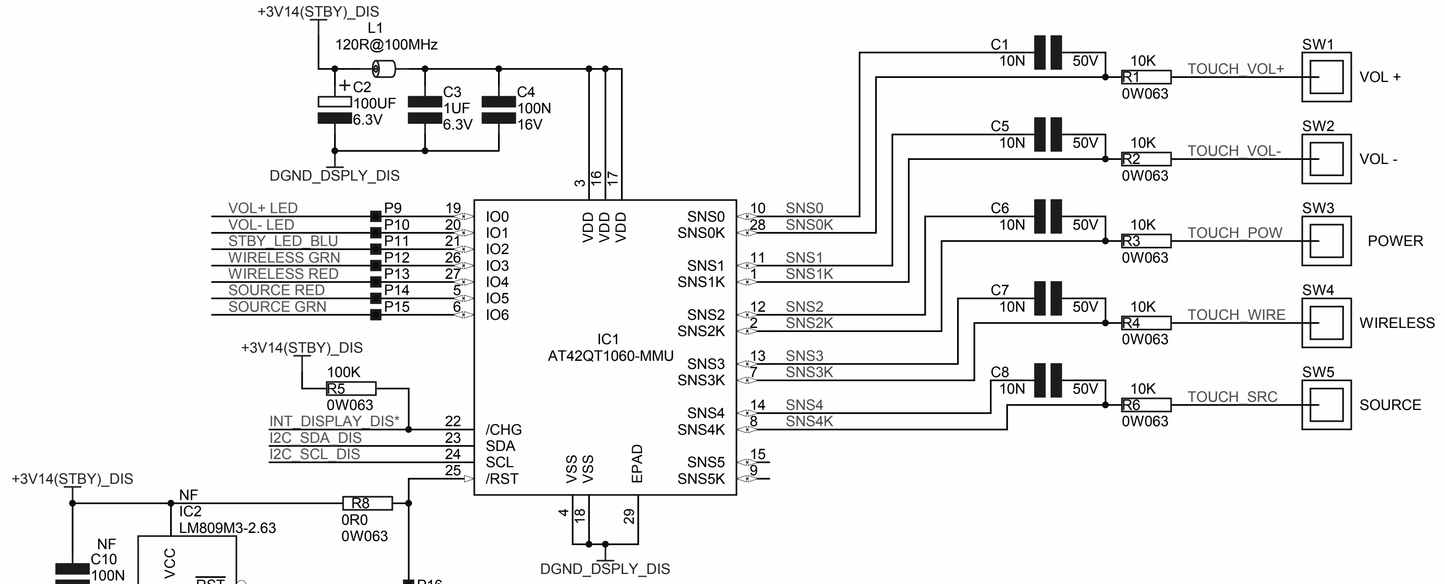
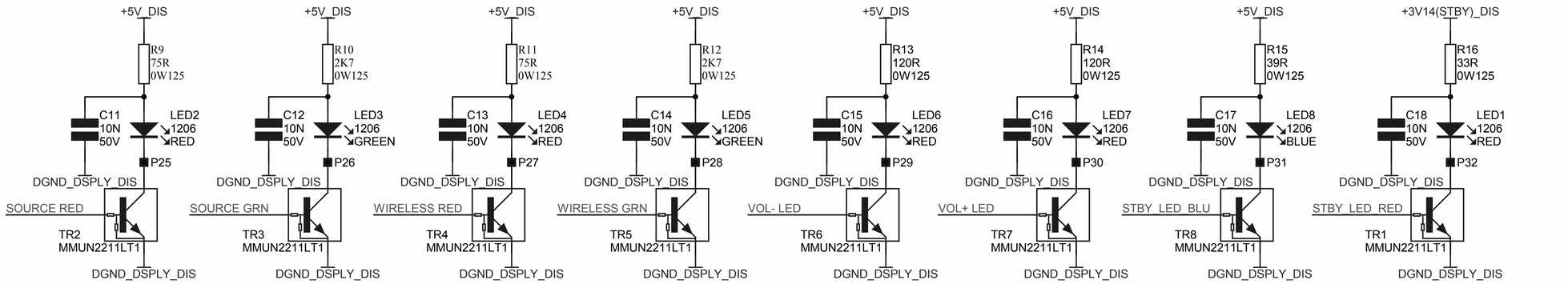
Printed: 28/09/2010
Sheet 7 **of** 7 | A2 | **DRAWING NO.** L182CT

Connections swapped over cf conn on iPod board









ITEM	QTY	PART No.	DESCRIPTION	NOTES
PCB1	1	L194PB	Blank PCB SoundCube Display	

DRAWING TITLE

SoundCube - Display

ARCAM

A & R Cambridge Ltd.
Pembroke Avenue
Waterbeach
Cambridge CB25 9QR

Filename: L194_C.1 SoundCube Display.SchDoc

Notes:

ECO No.	INITIALS	DATE	DESCRIPTION OF CHANGE	ISSUE
10_E118	NC	19/8/10	Change R10/R12 to 2k7 Change R9/R11 to 75R	C.1
10_E074	PK	04/03/10	Change IR rx footprint to correct pin reversal Green LED drive resistors changed	C.0
10_E001	PK	17/12/09	Change to touch sensitive buttons	B.0
09_E140	PK	08-07-09	Prototype release	A.0

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Printed: 19/08/2010

Sheet 1 of 1

A3

DRAWING NO. **L194CT**

ECO NR.	DATE	CHG.	ZONE	DESCRIPTION OF CHANGE	REL.	DR.	CHK.
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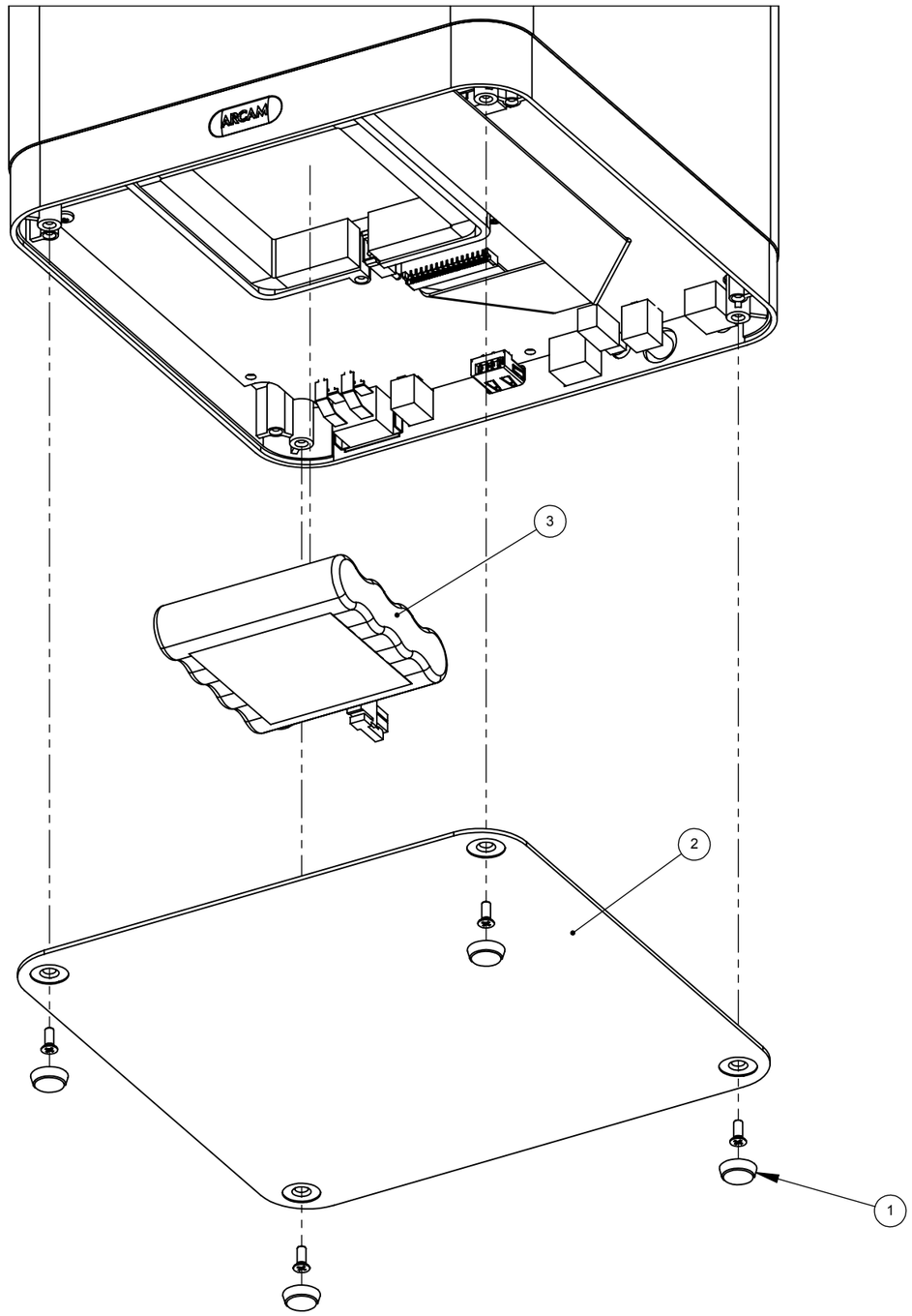

ITEM NO.	PART No.	DESCRIPTION	QTY
1	F075 / F075W	FOOT 3M BUMPON SJ-5012	4
2	E867CP / E867CPW	BOTTOM COVER PLATE - CUBE	1
3	E390AY	BATTERY ASSMEBLY - CUBE	1

ARCAM A & R CAMBRIDGE LTD

TOLERANCES UNLESS 0.00± 0.10
OTHERWISE STATED 0.0 ± 0.20
ANGULAR TOL. +2 DEGREES

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

DRAWN BY:	MCM
DATE:	12-10-2010
CHECKED BY:	MGB
ORIGINAL SCALE 1:2	
MATERIAL:	
FINISH:	SHT 1 OF 5

PART NUMBER AND DRAWING NUMBER
CUBE MAIN ASSEMBLY

DRAWING TITLE
BASE COVER

A3

0 10 20 30 40 50 60 70 80 90 100

ECO NR.	DATE	CHG.	ZONE	DESCRIPTION OF CHANGE	REL.	DR.	CHK.
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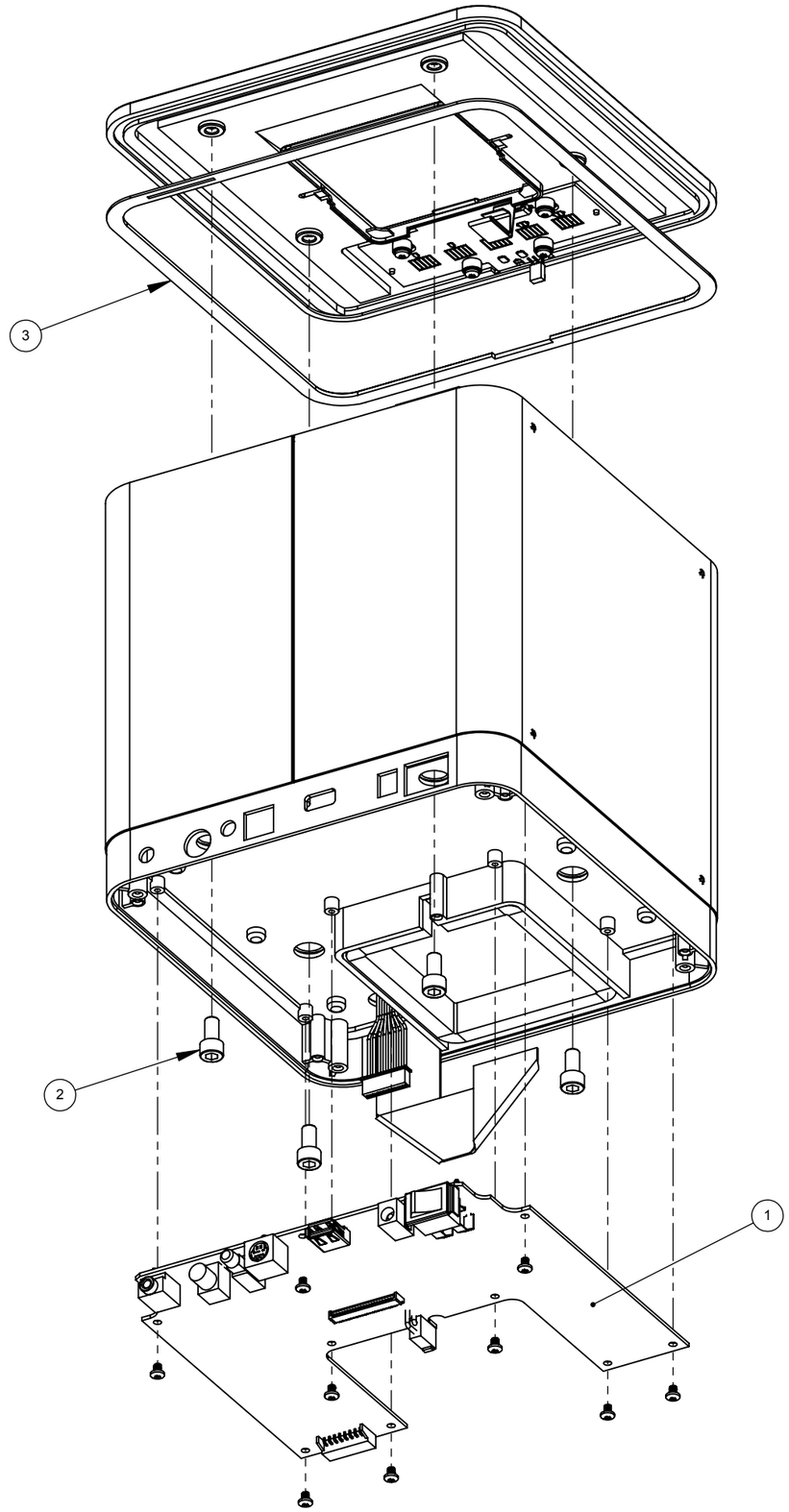

ITEM NO.	PART No.	DESCRIPTION	QTY
1	L182AY	PCB ASSY - MAIN	1
2	HA6L12B	CAP HEAD BOLT M6x12	4
3	E977PM	TRIM RING - ENCLOSURE - CUBE	1

ARCAM A & R CAMBRIDGE LTD

TOLERANCES UNLESS 0.00± 0.10
OTHERWISE STATED 0.0 ± 0.20
ANGULAR TOL. +2 DEGREES

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

DRAWN BY: MCM
DATE: 12-10-2010
CHECKED BY: MGB
ORIGINAL SCALE 1:2.5

MATERIAL:

FINISH:

SHT 2 OF 5

PART NUMBER AND DRAWING NUMBER
CUBE MAIN ASSEMBLY

DRAWING TITLE
MAIN PCB + TOP

A3

0 10 20 30 40 50 60 70 80 90 100

ECO NR.	DATE	CHG.	ZONE	DESCRIPTION OF CHANGE	REL.	DR.	CHK.
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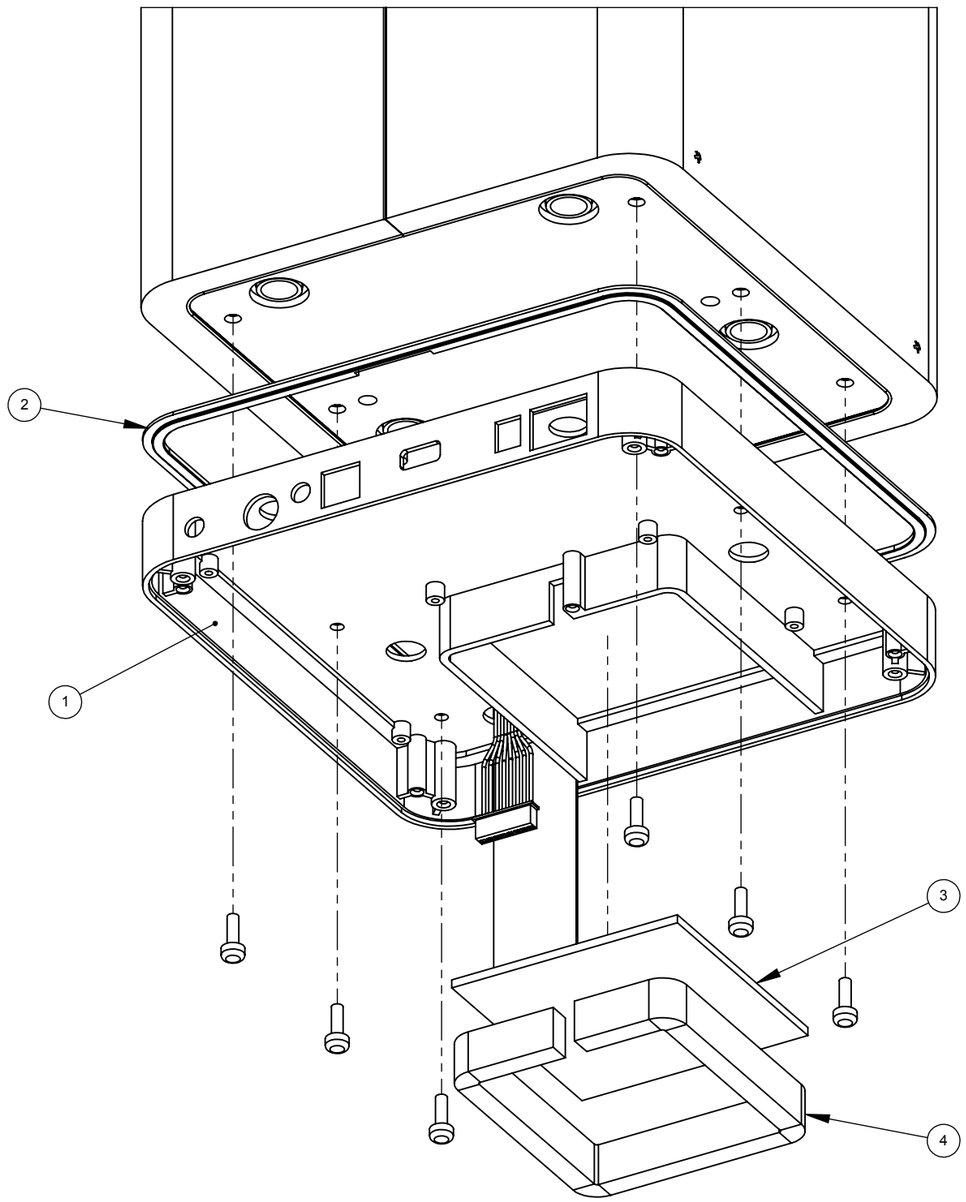

ITEM NO.	PART No.	DESCRIPTION	QTY
1	E105MC / E105MCW	BASE CASTING - CUBE	1
2	E977PM	TRIM RING - ENCLOSURE - CUBE	1
3	E850AP	FOAM PAD - BATTERY COMPARTMENT	1
4	E851AP	FOAM STRIP - BATTERY COMPARTMENT	1

ARCAM A & R CAMBRIDGE LTD

TOLERANCES UNLESS 0.00±0.10
OTHERWISE STATED 0.0 ±0.20
ANGULAR TOL. +2 DEGREES

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

DRAWN BY: MCM
DATE: 12-10-2010
CHECKED BY: MGB
ORIGINAL SCALE 1:2

MATERIAL:

FINISH:

SHT 3 OF 5

PART NUMBER AND DRAWING NUMBER
CUBE MAIN ASSEMBLY

DRAWING TITLE
BASE

A3

0 10 20 30 40 50 60 70 80 90 100

ECO NR.	DATE	CHG.	ZONE	DESCRIPTION OF CHANGE	REL.	DR.	CHK.
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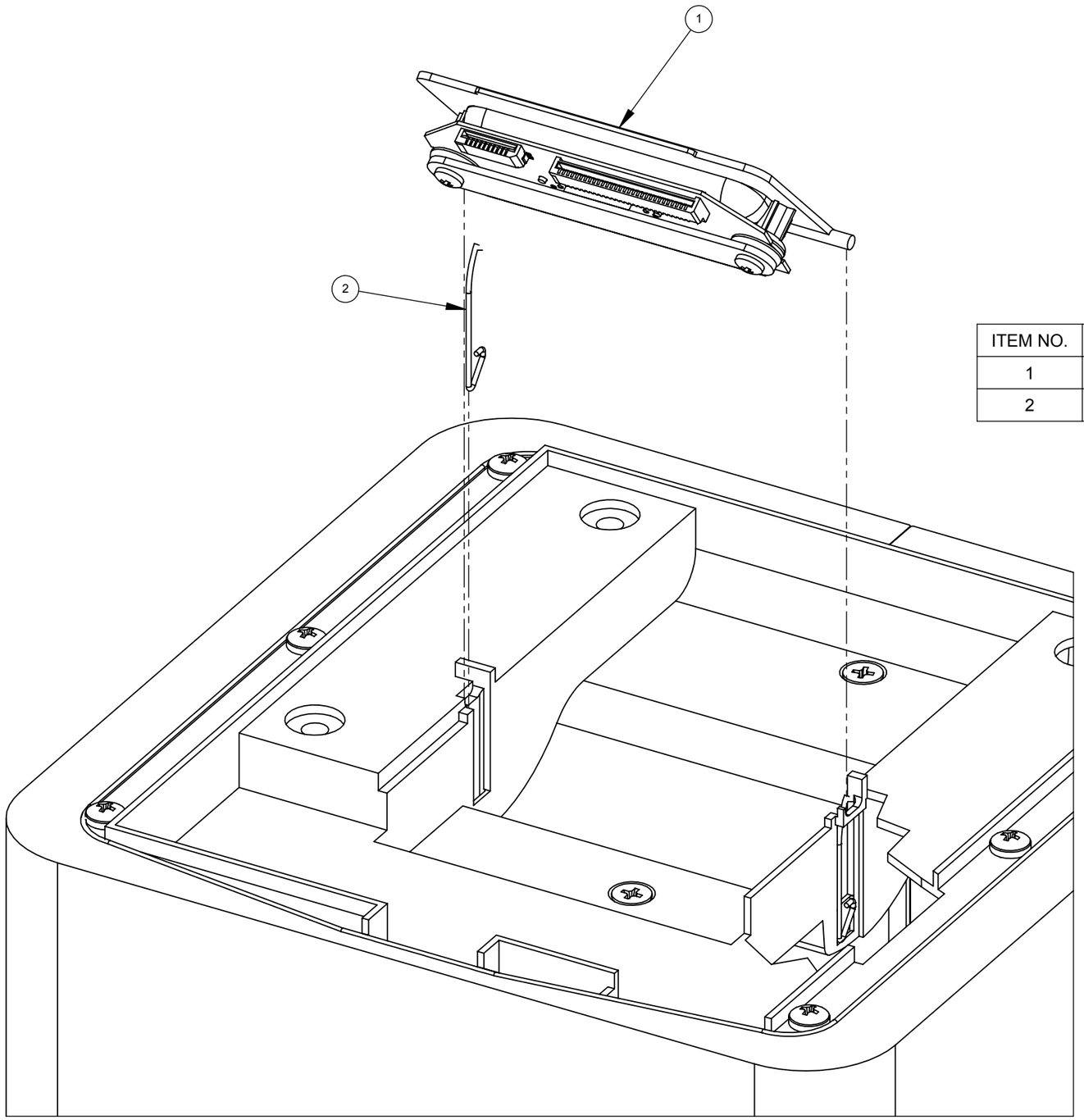

ITEM NO.	PART No.	DESCRIPTION	QTY
1	E398AY / E398AYW	DOCK ASSEMBLY - CUBE	1
2	F327	SPRING - REMOVABLE DOCK - CUBE	2

ARCAM A & R CAMBRIDGE LTD

TOLERANCES UNLESS 0.00± 0.10 OTHERWISE STATED 0.0 ± 0.20 ANGULAR TOL. +2 DEGREES	ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED	DRAWN BY:	MCM
		DATE:	13-9-2010
		CHECKED BY:	MGB
		ORIGINAL SCALE 1:1	
MATERIAL:			
FINISH:		SHT 4 OF 5	
PART NUMBER AND DRAWING NUMBER CUBE MAIN ASSEMBLY			
DRAWING TITLE iPOD DOCK			A3

0 10 20 30 40 50 60 70 80 90 100

ECO NR.	DATE	CHG.	ZONE	DESCRIPTION OF CHANGE	REL.	DR.	CHK.
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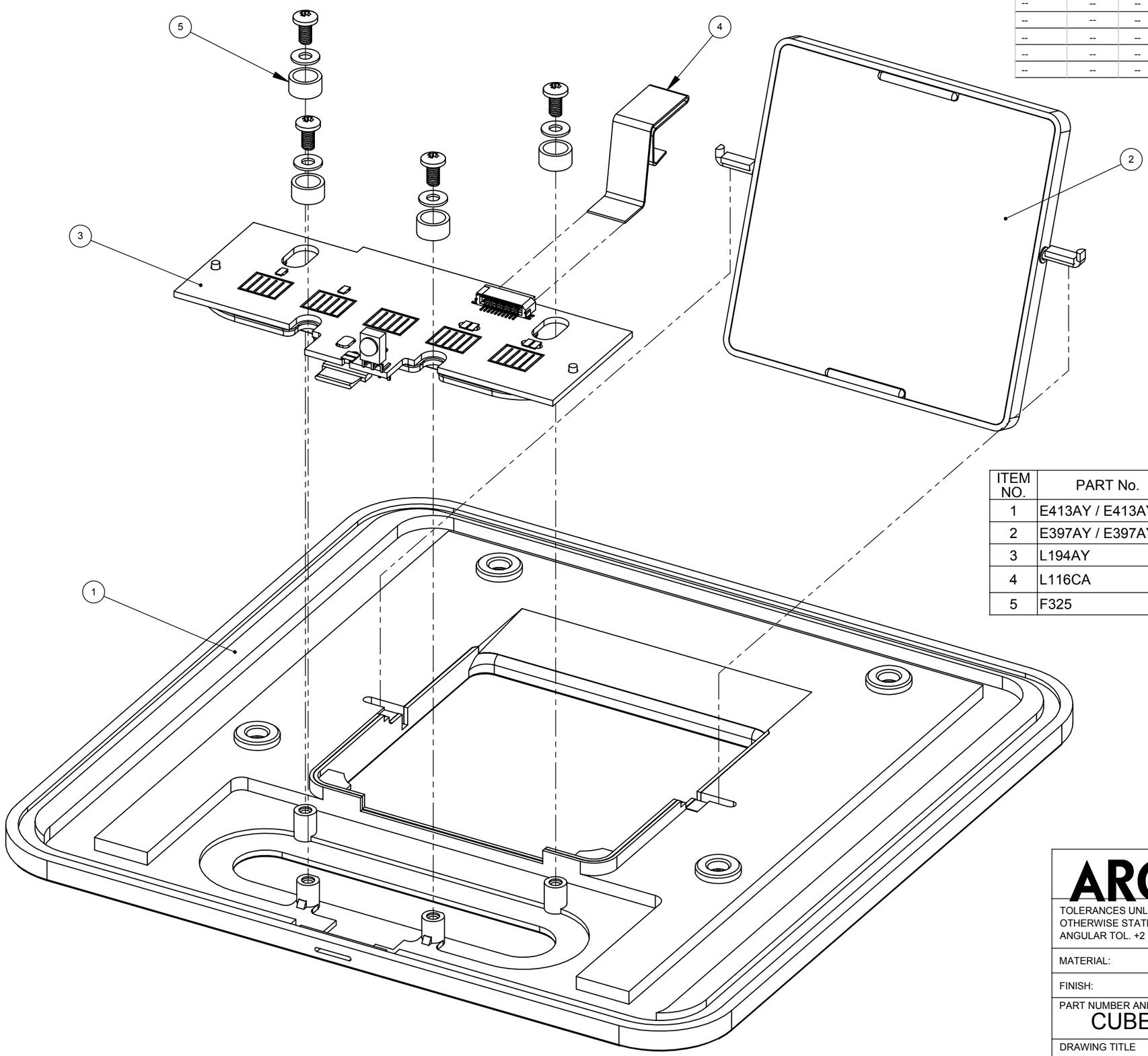


ITEM NO.	PART No.	DESCRIPTION	QTY
1	E413AY / E413AYW	TOP PLATE ASSEMBLY - CUBE	1
2	E397AY / E397AYW	DOCK FLAP ASSEMBLY - CUBE	1
3	L194AY	TOUCH BUTTON PCB ASSEMBLY	1
4	L116CA	FLEXFOIL - iPOD PCB TO BUTTON PCB	1
5	F325	NYLON SPACER	4

ARCAM A & R CAMBRIDGE LTD

TOLERANCES UNLESS 0.00± 0.10
OTHERWISE STATED 0.0 ± 0.20
ANGULAR TOL. +2 DEGREES

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

DRAWN BY: MCM
DATE: 13-9-2010
CHECKED BY: MGB
ORIGINAL SCALE 1:1

MATERIAL:

FINISH:

SHT 5 OF 5

PART NUMBER AND DRAWING NUMBER
CUBE MAIN ASSEMBLY

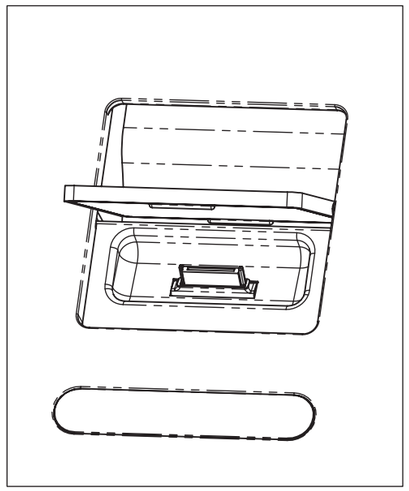
DRAWING TITLE
TOP PLATE

A3

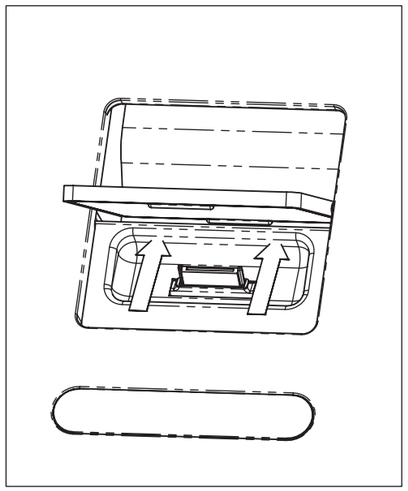
0 10 20 30 40 50 60 70 80 90 100

TO REPLACE iPOD PCB

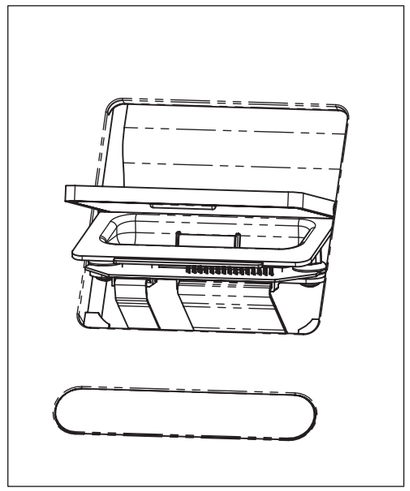
!! ANTI-STATIC PRECAUTIONS MUST BE TAKEN TO AVOID DAMAGE TO ELECTRONIC COMPONENTS !!



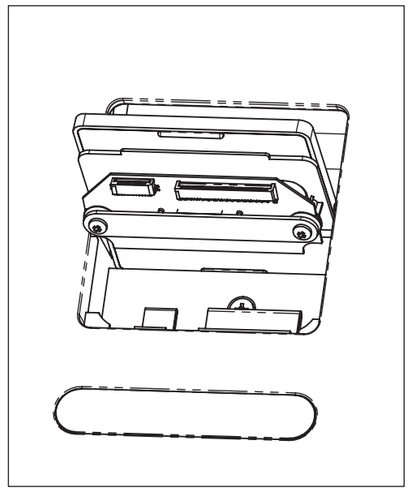
1. PARTLY OPEN DOCK FLAP



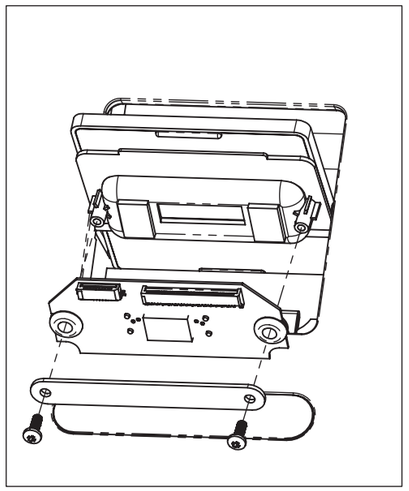
2. SLIDE DOCK REARWARDS AGAINST SPRING PRESSURE



3. HINGE DOCK UPWARDS TO REVEAL FLEXFOIL CABLES



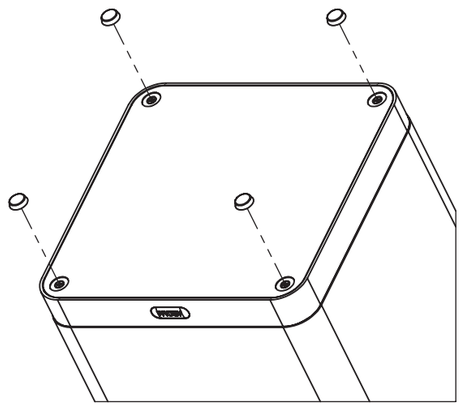
4. DISCONNECT FLEXFOILS & HINGE DOCK FULLY UPWARDS



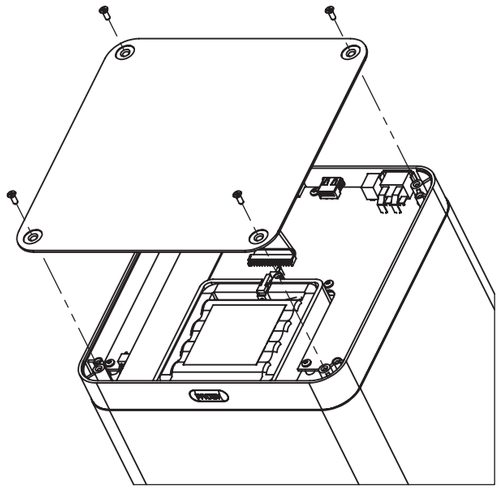
5. UNDO iPOD PCB SCREWS & REMOVE RETAINING BAR, GROMMETS & PCB

6. FIT GROMMETS TO NEW PCB & REVERSE REMOVAL INSTRUCTIONS...

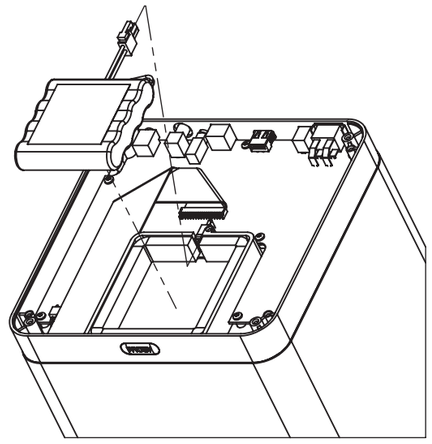
TO REPLACE BATTERY



1. REMOVE RUBBER FEET FROM BASE OF UNIT



2. REMOVE SCREWS & BASE COVER



3. REMOVE BATTERY & RELEASE CONNECTOR

4. FIT NEW BATTERY & CONNECTOR & REVERSE REMOVAL INSTRUCTIONS FIT NEW SELF-ADHESIVE FEET SUPPLIED

CAUTION

DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED.
REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE.

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